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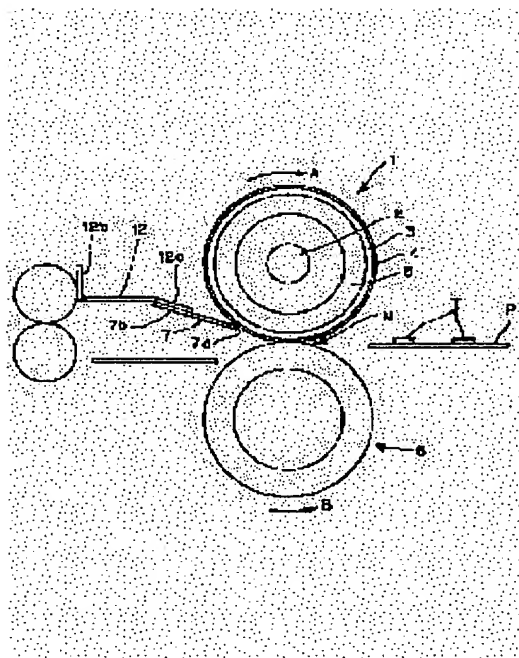
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(54) FIXING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a fixing device provided with a peeling sheet made possible to perform the stable peeling without damaging an image, paper sheet and a fixing roll.

SOLUTION: This fixing device is provided with the fixing roll 1 rotated in the direction of the arrow A, on a surface of which an elastic layer 3 is foamed, the pressure roll 6 rotated in the direction of the arrow B, while held in contact with the fixing roll 1, the peeling sheet 7 composed of plastic for peeling the paper sheet P allowed to pass through a nip part N from the fixing roll 1 surface provided on the downstream side than the nip part N in the rotary direction A, being held in contact with the fixing roll 1 surface by the end edge thereof.



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FIXING DEVICE

[Claim(s)]

[Claim 1] Fixing equipment characterized by providing the following The 1st body of revolution which has a heat source inside and is rotated in the predetermined direction It has the 2nd body of revolution rotated in the direction opposite to the hand of cut of this 1st body of revolution while contacting this 1st body of revolution. It pressurizes, while heating the form which supports a non-established toner image on the front face of the side in contact with the 1st body of revolution of the above by which these two body of revolution has been conveyed by the nip section which comes to contact mutually. In the fixing equipment fixed to this form in this non-established toner image the 1st body of revolution of the above an elastic layer forms in a front face -- having -- and the aforementioned nip section of the 1st body of revolution of the above -- the hand-of-cut downstream of this 1st body of revolution -- this -- the ablation sheet which exfoliates the form which the edge contacted the 1st body-of-revolution front face, and passed the aforementioned nip section from the body-of-revolution front face of the above 1st

[Claim 2] Fixing equipment according to claim 1 with which the aforementioned ablation sheet makes a base material a heat-resistant sheet plastic or a metal sheet, and is characterized by being the thing which comes to form a fluorine system resin layer in the edge in contact with this base-material table rear face and the 1st body of revolution of the above.

[Claim 3] Fixing equipment according to claim 1 characterized by the monolayer which the 1st body of revolution of the above becomes from silicone rubber or a fluororubber, or the elastic layer with a thickness of 0.3mm or more by which two or more layer laminating was carried out being the thing which it comes to form in a front face.

[Claim 4] Fixing equipment according to claim 3 characterized by the 1st body of revolution of the above being the thing which comes to form a fluorine system resin layer with a thickness of 0.03mm or less in the aforementioned elastic layer front face.

[Claim 5] the edge of the side to which the aforementioned ablation sheet contacts the body-of-revolution front face of the above 1st of this ablation sheet -- the shaft orientations of this 1st body of revolution -- receiving -- inclining -- this -- the fixing equipment according to claim 1 characterized by being arranged so that the 1st body-of-revolution front face may be contacted

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the fixing equipment used for the image recording equipment of electrophotography methods, such as an electronic copying machine and facsimile.

[0002]

[Description of the Prior Art] Conventionally, make the nip section of the roll of a couple which consists of a fixing roll and a pressure roll pass the form with which the toner image was imprinted, and the fixing equipment which makes a toner image weld to a form by heating with a fixing roll and pressurization with two rolls is widely used for it as fixing equipment to which the toner image imprinted on the form fixes in the image-recording equipment of electrophotography methods, such as an electronic copying machine and facsimile.

[0003] Generally, by this fixing method, since the toner image welded to the form contacts a fixing roll, the roll which coated the front face with the good fluorine system resin of a mold-release characteristic as a fixing roll is used. However, even if it uses such a fixing roll, since [that it is soft and] the fused toner has high viscosity, it has a possibility that a form may coil that it is easy to adhere to a fixing roll front face. Then, the method of usually forming the compulsive ablation equipment by the ablation presser foot stitch tongue as shown below, and preventing coiling round of the form to a fixing roll is adopted.

[0004] Drawing 10 is the outline block diagram of conventional fixing equipment equipped with the compulsive ablation equipment by the ablation presser foot stitch tongue.

[0005] The fixing roll 1 having the heater 2 which this fixing equipment rotates in the direction of arrow A as shown in drawing 10 , From the nip section N which the pressure roll 6 which contacts the fixing roll 1 and rotates in the direction of arrow B, and two rolls 1 and 6 come to contact, to the hand-of-cut downstream of the fixing roll 1 The edge contacts the front face of the fixing roll 1, and it has the ablation presser foot stitch tongue 10 which exfoliates the form P which passed the nip section N from the fixing roll 1. Usually, a rubber covered roll is used as a pressure roll 6, and it is arranged so that the fixing roll 1 may be pressed by the predetermined pressure.

[0006] As an ablation presser foot stitch tongue 10, conventionally, heat resistant resins, such as a polyimide and a polyphenylene ape fight, are cast, and a finishing thing is used for a sharp configuration in the nose of cam. It is installed so that such an ablation presser foot stitch tongue 10 may be pressed against the front face of the fixing roll 1 using a spring. The width of face of the

edge which touches fixing roll 1 front face of the ablation presser foot stitch tongue 10 is about 2mm, and it is common that the narrow ablation presser foot stitch tongue 10 of such width of face is arranged at about 5-6 shaft orientations of the fixing roll 1. Thus, since the ablation presser foot stitch tongue 10 does not touch the front face of the fixing roll 1 partially, in fixing roll 1 front face, the uneven press force is applied to the shaft orientations of the fixing roll 1 by the ablation presser foot stitch tongue 10, and fixing roll 1 front face may carry out partial wear, or may attach a blemish to a front face. Moreover, when a form is caught in any one ablation presser foot stitch tongue in two or more ablation presser foot stitch tongues and produces coiling round of a form, in response to the unusual force according [an adjoining ablation presser foot stitch tongue] to a form, it is strongly pushed on the fixing roll 1, or an ablation presser foot stitch tongue deforms, a big blemish may be attached to fixing roll 1 front face, or partial wear may be generated.

[0007] Then, in order to solve such a problem, the fixing equipment which exfoliates a form with the ablation sheet of plastics as shown below is indicated by JP,59-188681,A. Drawing 11 is the outline block diagram of conventional fixing equipment equipped with the compulsive ablation equipment by the ablation sheet of plastics.

[0008] The fixing roll 1 which this fixing equipment rotates in the direction of arrow A as shown in drawing 11 and with which the heater 2 was built in, From the nip section N which the pressure roll 6 which contacts the fixing roll 1 and rotates in the direction of arrow B, and two rolls 1 and 6 come to contact, to the hand-of-cut downstream of the fixing roll 1 The edge contacts the front face of the fixing roll 1, and it has the ablation sheet 11 which exfoliates the form P which passed the nip section N from the fixing roll 1. In the ablation sheet 11, they are 0.05mm or more in thickness, and bending elastic modulus 103 kg/cm². Above, the sheet plastic of 150 degrees C or more of melting points is used, and it is arranged so that the sharp edge may contact equally the whole front face of the shaft orientations of the fixing roll 1.

[0009]

[Problem(s) to be Solved by the Invention] However, with fixing equipment equipped with such an ablation sheet, like [at the time of monochrome image formation], although it can exfoliate satisfactory when [that the thickness of the toner image immediately after fixing is comparatively thin and] the viscosity of a toner image is large, for example When the thickness of the toner image immediately after fixing is comparatively thick, and a toner image is heated by the elevated temperature with a fixing roll like [at the time of color

picture formation] and adhesion is large. The phenomenon of a lot of toners having adhered to the fluorine system resin layer of a fixing roll front face, the excessive ablation force acting on the edge of the ablation sheet of a thin film, an ablation sheet nose of cam producing plastic deformation, and being turned over, and it becoming impossible to exfoliate a form may be caused. Moreover, simultaneously with it, the nose of cam of a form also receives a big injury, and may have been turned over, it may lenticulate, or a paper jam may be caused. In especially fixing of a full color picture, in order to use the toner of a Magenta, yellow, cyanogen, and four colors of black, the non-established toner image with which a lot of toners than the time of fixing of monochrome picture were imprinted [they piled them up and] and formed must be established, and the big ablation force is required at the time of ablation. Furthermore, since it is required to make a toner fully color in fixing of a color picture, a toner must fully be heated for the reason, and melting must be carried out, therefore the toner immediately after nip section passage serves as hypoviscosity, the still bigger ablation force will be needed.

[0010] Although deformation of the thickness of 200 micrometers or more, then an ablation sheet can prevent an ablation sheet in order to make it an ablation sheet not deform, even if the big ablation force is applied to an ablation sheet, the edge portion of the edge of an ablation sheet will be several or more times the thickness of the form which should exfoliate, and it becomes impossible to exfoliate a form stably. Moreover, if thickness of an ablation sheet is thickened too much, a possibility that the flexural rigidity of an ablation sheet may become large and may damage a fixing roll will also be produced.

[0011] When two or more ablation presser foot stitch tongues currently used abundantly at fixing of the conventional monochrome picture are used instead of using an ablation sheet, a toner image is damaged by the ablation presser foot stitch tongue, and a problem [as / in an above-mentioned ablation sheet] tends to produce a picture defect, since the toner image after fixing is compulsorily removed by the ablation presser foot stitch tongue, although it does not generate. Therefore, a color picture is not almost compulsorily removed by the ablation presser foot stitch tongue.

[0012] From such a situation, a self stripping method is adopted as fixing of a color picture in many cases. A self stripping method is an ablation method with which it was made for a form to exfoliate with nature from a fixing roll in the nerve of a form, and the elasticity of a fixing roll, without using the compulsive ablation equipment by the ablation presser foot stitch tongue, the ablation sheet, etc. In color picture fixing, as a means for forming this self stripping method,

the method which usually always supplies the oil of a large quantity (more than 10 mg/A4 size paper) to the elastic layer front face comparatively further using the fixing roll in which the elastic layer using silicone rubber excellent in the mold-release characteristic was formed, rather than a fluororesin on the front face of a roll core is adopted widely.

[0013] However, there are the following various problems in the conventional fixing equipment which attains self stripping.

(1) The elastic layer of the silicone rubber of a fixing roll front face may be worn out, a mold-release characteristic may deteriorate, or the reliability of a fixing roll may be reduced according to the cause of oil sinking into the interior of a fixing roll, and degrading an elastic layer.

(2) Oil must be supplied periodically, and it is inferior to maintenance nature, and is unsuitable for a small copying machine and a small printer.

(3) It is easy to reduce the retouch nature in a ball-point or ink on a copy that oil tends to remain. this invention aims at offering fixing equipment equipped with the exfoliation sheet which can perform exfoliation stabilized without doing damage to a picture, a form, and a fixing roll in view of the above-mentioned situation.

[0014]

[Means for Solving the Problem] The 1st fixing equipment of this invention which attains the above-mentioned purpose It has the 1st body of revolution which has a heat source inside and is rotated in the predetermined direction, and the 2nd body of revolution rotated in the direction where the hand of cut of the 1st body of revolution is opposite while contacting the 1st body of revolution. It pressurizes, while heating the form which supports a non-established toner image on the front face of the side in contact with the 1st body of revolution by which these two body of revolution has been conveyed by the nip section which comes to contact mutually. In the fixing equipment fixed to the above-mentioned form in a non-established toner image the 1st body of revolution of the above An elastic layer is formed in a front face. rather than the above-mentioned nip section of the 1st body of revolution of the above to the hand-of-cut downstream of the 1st body of revolution The edge contacts the 1st body-of-revolution front face, and it is characterized by having the exfoliation sheet which exfoliates the form which passed the above-mentioned nip section from the body-of-revolution front face of the above 1st.

[0015] Moreover, the 2nd fixing equipment of this invention which attains the above-mentioned purpose It has the 1st body of revolution which has a heat source inside and is rotated in the predetermined direction, and the 2nd body of

revolution rotated in the direction where the hand of cut of the 1st body of revolution is opposite while contacting the 1st body of revolution. It pressurizes, while heating the form which supports a non-established toner image on the front face of the side in contact with the 1st body of revolution by which these two body of revolution has been conveyed by the nip section which comes to contact mutually. While having the contact section which contacts the 1st body-of-revolution front face by the hand-of-cut downstream of the 1st body of revolution in the fixing equipment fixed to the above-mentioned form rather than the above-mentioned nip section of the 1st body of revolution of the above in a non-established toner image It has the configuration further prolonged in the hand-of-cut upstream of the 1st body of revolution rather than the contact section. The point prolonged in the upstream is characterized by having the exfoliation sheet which exfoliates the form which passed the above-mentioned nip section which it comes to arrange by separating a predetermined gap from the 1st body-of-revolution front face from the body-of-revolution front face of the above 1st.

[0016]

[Embodiments of the Invention] Hereafter, the operation form of this invention is explained.

[0017] Drawing 1 is the outline block diagram of the 1st operation form of the fixing equipment of this invention.

[0018] The fixing equipment shown in drawing 1 is equivalent to the 1st fixing equipment of this invention, and the hand of cut A of the fixing roll 1 is equipped with the pressure roll 6 which rotates in the opposite direction of arrow B, contacting the fixing roll 1 which rotates in the direction of arrow A, and the fixing roll 1. It pressurizes, while heating the form P which has been conveyed by the nip section N of the rolls 1 and 6 of these couples and which supports the non-established toner image T on a front face, and the non-established toner image T is fixed to Form P. From the nip section N of the fixing roll 1, the edge contacts fixing roll 1 front face, and the hand-of-cut A downstream of the fixing roll 1 is equipped with the exfoliation sheet 7 which exfoliates the form P which passed the nip section N from fixing roll 1 front face.

[0019] Here, the fixing roll 1 of this operation form is equivalent to the 1st body of revolution said to this invention, and the pressure roll 6 of this operation form is equivalent to the 2nd body of revolution said to this invention.

[0020] The fixing roll 1 covers the elastic layer 3 with a thickness of 0.5mm on the front face of the core 5 of aluminum, further, covers the surface layer 4 with a thickness of 20 micrometers, is formed on it, and has the heater 2 as a heat

source inside. With this operation form, silicone level-status-register rubber (Liquid Silicone Rubber) with a rubber degree of hardness of 25 degrees is used as an elastic layer 3. Moreover, the PFA (Perfluoro-alkoxyfluoro plastics) tube is used as a surface layer 4.

[0021] In addition, you may use the elastic layer which can use a fluororubber in addition to silicone rubber, and consists of silicone rubber and a fluororubber as the quality of the material of the elastic layer 3 and by which two or more layer laminating was carried out. Drawing 2 is the cross section of the exfoliation sheet with which the fixing equipment of the 1st operation form was equipped.

[0022] As shown in drawing 1 and drawing 2, the fluorine system resin layer 9 with a thickness of 10 micrometers is covered by edge 8c in contact with surface 8a of the base material 8 of polyimide resin with a thickness of 75 micrometers, and a base material 8, rear-face 8b, and the fixing roll 1, and the exfoliation sheet 7 is formed in it. Since the fluorine system resin layer 9 is formed, a PFA film can be used.

[0023] In addition, although polyimide resin is used as a base material 8 of the exfoliation sheet 7 with this operation form, the base material 8 of the exfoliation sheet 7 is not limited to polyimide resin, and may use a heat-resistant sheet plastic or a heat-resistant metal sheet.

[0024] Edge 7a of the point contacts the fixing roll 1, and the exfoliation sheet 7 is arranged along with the tangential direction lengthened toward the direction of the hand of cut A of the fixing roll 1 from the contact. Edge 7a of the exfoliation sheet 7 has only the width of face in contact with the whole width of face of the shaft orientations of the fixing roll 1, and as for the exfoliation sheet 7, the back end section 7b is being fixed to point 12a of the metal support plate 12 so that the edge 7a may be forced on the front face of the fixing roll 1 by the 300g contact pressure. As for the support plate 12, the back end section 12b is being fixed to the frame (not shown) of this fixing equipment with the screw thread. Sufficient rigidity is secured, although the exfoliation sheet 7 is a thin sheet, since length from edge 7a of a point to back end section 7b is comparatively short-*****ed) with 2mm - about 7mm.

[0025] It is equivalent to the exfoliation force for exfoliating that heating pressurization tends to be carried out, and the toner image T on Form P tends to fuse the contact pressure of edge 7a of the exfoliation sheet 7, and the fixing roll 1 in the nip section N, and it tends to adhere to the fixing roll 1, and the pressure welding of the exfoliation sheet 7 needs to be carried out to the fixing roll 1 by the contact pressure which corresponds to the exfoliation force decided by the character of the toner image which should be established In addition,

about the measuring method of the exfoliation force, it mentions later. Moreover, the contact pressure of the exfoliation sheet 7 and the fixing roll 1 is defined also in consideration of relevance with many following elements in addition to relevance with the above-mentioned exfoliation force.

[0026] First, flapping which produces the minimum value of a contact pressure in edge 7a of the heated exfoliation sheet 7 must be sufficient value to disappear, and the maximum of a contact pressure must be a value below the limitation which a blemish generates on the amount of marginal deflections, plastic deformation start load, or the fixing roll 1 of an exfoliation sheet. The practical optimum value of these restrictions to a contact pressure is within the limits of 100g-500g in A4 horizontal size form width-of-face:297mm.

[0027] When a heat-resistant sheet plastic is used as a base material of the exfoliation sheet 7, the thickness of the exfoliation sheet 7 for obtaining this contact pressure needs to be 50 micrometers or more. However, when the thickness of the exfoliation sheet 7 is set to 150 micrometers or more, since [in which Form P runs against edge 7a of the exfoliation sheet 7, and can exfoliate smoothly] it is lost, it is desirable [the practically optimal sheet thickness] that it is 50 micrometers - 150 micrometers.

[0028] Since the PFA film with a thickness of 10 micrometers is covered by edge 7a of the exfoliation sheet 7 in this operation form, even if the toner image of the melting state immediately after fixing rubs the front face of the exfoliation sheet 7, the exfoliation sheet 7 is not damaged. This is because the contact pressure per unit area of the exfoliation sheet 7 becomes small since the toner image is supported all over edge 7 of exfoliation sheet 7 a. However, since a toner image is rubbed at the both ends of edge 7a of the exfoliation sheet 7, a line is attached to a toner image and a quality-of-image defect is generated when the width of face of the exfoliation sheet 7 is narrower than the width of face of Form P, the width of face of the direction of fixing roll axis of the exfoliation sheet 7 needs to cover the whole form width of face.

[0029] Although the toner and paper powder which were offset on the fixing roll 1 are scratched by edge 7a of the exfoliation sheet 7 and may be accumulated on the upper surface of the exfoliation sheet 7 near edge 7a with the fixing equipment of this operation form Since, as for edge 7a, the fluorine system resin is covered, the adhesion force to the exfoliation sheet 7 of a toner or paper powder is weak. Since it is removed by contacting the toner and paper powder with which the nose of cam of the form P supplied to the nip section N next was accumulated even if a toner and paper powder are accumulated somewhat, dirt is not accumulated so much.

[0030] In addition, it is desirable to arrange the exfoliation sheet 7 aslant so that edge 7a of the exfoliation sheet 7 may be made to incline to the shaft orientations of the fixing roll 1 and fixing roll 1 front face may be contacted. Namely, by giving a 0.5mm - about 2mm difference for the distance from the both-sides edge of the cross direction of edge 7a to the nip section N at a both-sides edge, and arranging the exfoliation sheet 7 aslant to the shaft of the fixing roll 1 The impulse force which produces Form P at the time of an exfoliation start when it can begin to exfoliate gradually from one crosswise side edge and a solid black picture is near the nose of cam of Form P can be reduced, and it is desirable.

[0031] As mentioned above, the advantage of the compulsive exfoliation method by the exfoliation sheet which was not able to be used for color fixing although the 1st fixing equipment of this invention was conventionally used for monochrome fixing, The advantage of a self stripping method is combined. fundamentally While giving a self stripping pressure to a form by using the front face of a fixing roll as an elastic layer and reducing the exfoliation force of the form in color fixing to level of the same grade as the exfoliation force in monochrome fixing By carrying out the pressure welding of the exfoliation sheet to a fixing roll by the low contact pressure, it is going to realize the fixing equipment which can perform exfoliation stabilized without doing damage to a picture, a form, and a fixing roll also by the case of color fixing.

[0032] The above-mentioned exfoliation force is measured by the following measuring device.

[0033] Drawing 3 is the outline block diagram of an exfoliation force measuring device.

[0034] As shown in drawing 3 , while this exfoliation force measuring device contacts the fixing roll 21 which rotates in the direction of arrow A like actual fixing equipment, and the fixing roll 21, the hand of cut A of the fixing roll 21 is equipped with the pressure roll 26 which rotates in the opposite direction B. In the interior of the fixing roll 21, the heater 22 is arranged as a heat source. It pressurizes, while heating the form P which has been conveyed by the nip section N of the rolls 21 and 26 of these couples and which supports the non-established toner image T on a front face, and the non-established toner image T is fixed to Form P.

[0035] The downstream of the hand of cut A of the fixing roll 21 is equipped with the exfoliation presser foot stitch tongue 23 which exfoliates the form P which passed the nip section N from fixing roll 21 front face from the nip section N of the fixing roll 21. Edge 23a of the exfoliation presser foot stitch tongue 23 is

forced on fixing roll 21 front face by the contact pressure set up beforehand. The strain gage 24 is stuck on rear-face 23b of the exfoliation presser foot stitch tongue 23, and the contact pressure which acts on the exfoliation presser foot stitch tongue 23 at the time of carrying out forcible exfoliation of the fixing toner image after the form P which supported the non-established toner image T passes the nip section N by the exfoliation presser foot stitch tongue 23, i.e., the exfoliation force, is measured.

[0036] As concrete measurement conditions, a solid non-established test picture is formed in the Fuji Xerox A4 size S paper in width of face of 100mm, and picture size with a length of 80mm, it is established by form bearer rate 100 mm/sec with the fixing roll 21 set as the heating temperature of 10-degree-C interval in this solid non-established test picture, and a strain gage 24 detects the exfoliation force at that time. The fixing conditions at that time are as follows.

Fixing roll: The fluorine system resin coat hard roll which covered the PFA tube with a thickness of 20 micrometers to the aluminum core with a diameter of 40mm.

[0037] Pressure roll: The elastic body roll which covered silicone rubber with 3mm [in thickness], and a rubber degree of hardness of 60 degrees to the aluminum core with a diameter of 34mm.

[0038] Nip width : 6mm.

[0039] Toner : in monochrome toner, use and the toner weight per unit area are a toner for Vivace550 by F company 0.65 mg/cm² A color toner is AColor by F company. Use and the toner weight per unit area are the toner which included 4 % of the weight and the polypropylene wax for the polyester wax in the toner for 620 1% of the weight 2.0 mg/cm²

[0040] The result measured using this measuring device is shown in Table 1, 2, and 3.

[0041]

[Table 1]

	トナー	トナー重量 (mg/cm ²)	画像光沢 (%)	最大剥離力 (g)
白黒定着 (フッ素樹脂ロール)	Vivace 550トナー	0.65	8	10
カラー定着 (フッ素樹脂ロール)	A Color トナー + Wax	2.0	80	130
		1.3	68	90
		0.65	60	50
		0.65	15	17

[0042] As shown in Table 1, when the so-called hard roll which coated the fluororesin is used as a fixing roll, in monochrome fixing, the maximum exfoliation force is increasing to 13 times as much 130g as monochrome fixing in color fixing to the maximum exfoliation force being 10g in the fixing allowable-temperature range. Since the value of this maximum exfoliation force is a value over a test picture with a width of face of 100mm, in order to establish it in the color picture of 297mm width of face of A4 horizontal width size, the impulse force of about 400g will act on an exfoliation sheet at the moment of exfoliating. Therefore, there is a possibility that the exfoliation sheet with a thickness of 75 micrometers made from a polyimide may deform plastically, it may lenticulate in response to damage also with the big nose of cam of a form, or a paper jam may occur.

[0043] In 297mm reduced property of 70g and A4 horizontal width size, it is confirmed that the critical load which can exfoliate stably without the plastic deformation and ***** of an exfoliation sheet arising according to the experiment of this invention persons, without the nose of cam of a form receiving damage is about 200g by the test picture with a width of face of 100mm.

[0044] Moreover, as for the toner weight and the maximum exfoliation force per unit area, a series of experimental results shown in Table 1 show that it is in proportionality mostly. Moreover, if it raises that the maximum exfoliation force becomes large, i.e., picture gloss, as heat is fully supplied to a toner, toner viscosity is lowered and a toner is brought close to a melting flow state, in order to make a color toner color enough, needing the large exfoliation force is also confirmed.

[0045] It turns out that needing the larger ablation force than monochrome

fixing from the above thing in color fixing has many (1) toner weights, and that it is based on two factors of making [high]-(2) picture gloss **.

[0046] it is shown in Table 1 -- as -- the toner weight in color fixing -- 2.0 mg/cm² from -- 0.65 mg/cm² of the same grade as the case of monochrome fixing up to -- by making it decrease, the ablation force can be reduced to 10-20g of the same grade as black and white

[0047] However, since picture gloss falls from 80 gross (75 degree-75 degree measurement) to 15 gross (75 degree-75 degree measurement) of the same grade as the case of monochrome fixing and the quality of a color picture deteriorates sharply as a result, such a policy cannot be taken.

[0048] Then, this invention persons performed examination about a fixing roll, in order to enable it to apply an exfoliation sheet also to color fixing. First, paying attention to the surface structure of a fixing roll, the so-called exfoliation force of the so-called hard roll with which the fluorine system resin layer was formed in the front face, and the soft roll with which the elastic layer was formed in the front face was measured. The exfoliation force measuring device shown in drawing 3 was used for the measuring device.

[0049] Table 2 is as a result of [which covered silicone level-status-register rubber with 0.1mm - 1.0mm / in thickness /, and a rubber degree of hardness of 25 degrees as an elastic layer to the core made from aluminum with a diameter of 40mm, and covered the fluorine system resin layer on the elastic layer front face further as a fixing roll / at the time of performing color fixing using the so-called soft roll] measurement. The PFA tube with a thickness of 20 micrometers is used as a fluorine system resin layer.

[0050]

[Table 2]

	トナー	弾性層厚さ (mm)	表面層厚さ (μ m)	最大剥離力 (g)
カラー定着 (シリコンゴム弾性層 +フッ素樹脂表面 層の弾性体ロール)	A Color トナー + Wax (2.0mg/cm ²)	0	20 (PFAチューブ)	130
		0.15		90
		0.30		65
		0.50		60
		1.0		55

[0051] The critical load which can stabilize and exfoliate the maximum

exfoliation force when elastic layer thickness is 0.3mm or more, although the maximum exfoliation force is over the above-mentioned critical-load:70g when the thickness of the elastic layer (silicone rubber) of a fixing roll is less than 0.3mm as shown in Table 2: It can be made to fall to the level of 70g or less.

[0052] Therefore, with the conventional soft roll, what elastic layer thickness was made to increase to 2mm - about 3mm, and the exfoliation force was reduced or less to about 10g, and was performing exfoliation by self stripping can be considered as the soft roll which has an about a little more than 0.3mm thin elastic layer by this invention. Usually, since the heat source with which the interior of a fixing roll is equipped when it became possible to make elastic layer thickness of a soft roll thin can be made small since thermal conductivity is low, and the path of a fixing roll also becomes small, an elastic layer becomes possible [miniaturizing fixing equipment].

[0053] As explained above, by using the fixing roll with which the elastic layer was formed in the front face shows that the ablation force can be reduced sharply. Moreover, the critical load which does an injury for the ablation force to neither a form nor an ablation sheet: It is possible to make it fall to 70g or less, and an ablation sheet can be applied to the fixing equipment of a color picture recording device.

[0054] Inside a nip, it is deforming so that an elastic layer may wrap in a toner image, when a pressure is opened wide at a nip outlet, deformation of an elastic body tends to return, a micro slip takes place by the interface of a toner image and an elastic body, and the mechanism to which the ablation force falls to a fixing roll front face by covering an elastic layer is considered to be for this micro slip to reduce the ablation force. Therefore, elastic layer thickness required to reduce the ablation force will call it the thickness which an elastic layer can deform so that the toner layer height on a form may be absorbed in an elastic layer and a toner may be wrapped in. If toner layer height is less than 10% of elastic body layer thickness when an elastic layer is pressurized inside a nip, a part for toner layer height is absorbable. Considering that the maximum toner layer height in color picture formation is about 30 micrometers, required elastic layer thickness will call it 0.3mm or more.

[0055] By the way, although the fluorine system resin layer acts in the direction which bars elastic deformation when a fluorine system resin layer is formed in an elastic layer front face, if fluorine system resin layer thickness is about 30 micrometers or less below toner layer height that is, it is rare [it] to reduce the toner layer height absorptance of an elastic body.

[0056] The fixing equipment which can perform ablation stabilized without

application of an ablation sheet could reduce the ablation force below to the possible value, and doing an injury to a picture, a form, and a fixing roll also by the case of color fixing when a fluorine system resin was covered on an elastic layer front face from the above thing that elastic layer thickness should just be 0.3mm or more and the thickness was 0.03mm or less is realizable.

[0057] Table 3 is as a result of [of the ablation force at the time of performing color fixing to the core made from aluminum with a diameter of 40mm as a fixing roll only using the soft roll which covered silicone rubber with a thickness of 0.3mm as an elastic layer] measurement. The ablation force measuring device shown in drawing 3 was used for the measuring device.

[0058] In this case, since it does not have the surface layer of a fluororesin like the fixing roll of Table 2, when not supplying oil to a fixing roll front face at all, the front face of silicone rubber is worn out for a short time, and cannot bear practical use. Then, it was established supplying the oil of 1 mg/A4 size paper - 10 mg/A4 size paper to a fixing roll front face, and the exfoliation force was measured.

[0059]

[Table 3]

	トナー	最大剥離力			
		オイル供給量 (mg/A4サイズ紙)			
		0	1	5	10
カラー定着 (シリコン弾性層 だけの弾性体ロー ル)	A Color トナー + Wax (2.0mg/cm ²)	65g (摩耗)	20g	5g	1g

[0060] Since wear of silicone rubber will cause picture degradation if fixing is continued with oil not supplied, although exfoliation force:65g measured value is obtained when the oil amount of supply is zero as shown in Table 3, it cannot be established on this condition. However, by supplying the slight oil about 1 mg/A4 size paper to a fixing roll front face, wear of silicone rubber can be prevented and the exfoliation force can be reduced sharply. If the oil amount of supply is made to increase furthermore and it is the oil amount of supply of 10 mg/A4 size paper of the same grade as the conventional color fixing, although the exfoliation force can be reduced to the field near self stripping, if the oil amount of supply increases, an exfoliation sheet will scratch oil, the nose of cam

of an exfoliation sheet will get wet in oil, it is imprinted at the nose of cam of a form, and there is a possibility that the trouble of an oil stain may occur. Therefore, in the case of fixing equipment equipped with the exfoliation sheet, the oil amount of supply needs to make it practically below 1 mg/A4 size paper. As shown in Table 3, even when the oil amount of supply is 1 mg/A4 size paper, the exfoliation force is 20g, and it is possible to apply an exfoliation sheet.

[0061] Thus, although it is possible to reduce the exfoliation force by supplying the oil of a small amount to a fixing roll front face also with the fixing roll with which a fluorine system resin layer was not formed in the elastic layer front face, but only the elastic layer was formed. If oil is used as mentioned above, oil will sink into the interior of a fixing roll. reduce reliability or Since the facility for supply of oil is required or it is easy to start the problem of oil remaining and reducing the retouch nature in a ball-point or ink on a copy, as shown in Table 2, it is desirable to use the fixing roll with which the fluorine system resin layer was formed in the elastic layer front face of a fixing roll.

[0062] In addition, it is possible to reduce the ablation force in an abbreviation half by supplying the amount of oil of 1 mg/A4 size paper to an elastic layer front face also by the case of the fixing roll which has a fluorine system resin layer. In order to avoid trouble generating of an oil stain also in this case, as for the oil amount of supply, it is desirable to set below to 1 mg/A4 size paper.

[0063] Next, the operation gestalt of the 2nd fixing equipment of this invention is explained.

[0064] Drawing 4 is the cross section of the ablation sheet used for the 2nd fixing equipment of this invention.

[0065] The ablation sheet 13 used for the 2nd fixing equipment of this invention is shown in drawing 4. The 1st body of revolution which the 2nd fixing equipment of this invention has a heat source inside like the 1st fixing equipment of this invention, and is rotated in the predetermined direction, It has the 2nd body of revolution rotated in the direction opposite to the hand of cut of the 1st body of revolution while contacting the 1st body of revolution. Although it pressurizes while heating the form which supports a non-established toner image on the front face of the side in contact with the 1st body of revolution by which these two body of revolution has been conveyed by the nip section which comes to contact mutually, and a non-established toner image is fixed to a form. The 2nd fixing equipment of this invention is different from the 1st fixing equipment of this invention in the following two points.

[0066] The 1st difference is a point which is different from the ablation sheet 7 (refer to drawing 1) with which the 1st fixing equipment of this invention is

equipped with the composition and the operation of the ablation sheet 13 with which the 2nd fixing equipment of this invention is equipped. Namely, the ablation sheet 13 with which the 2nd fixing equipment of this invention is equipped While having the contact section 15 which contacts fixing roll 1 front face by the downstream of the hand of cut A of the 1st body of revolution 1 from the nip section N of the fixing roll 1 (the 1st body of revolution) Rather than the contact section 15, it has the configuration further prolonged in the upstream of the hand of cut A of the fixing roll 1, and from fixing roll 1 front face, point 13a prolonged in the upstream separates a predetermined gap, and is arranged.

[0067] Although it was indispensable requirements that the 2nd difference is equipped with the elastic layer 3 (refer to drawing 1) formed in the front face of a fixing roll in the 1st fixing equipment of this invention, with the 2nd fixing equipment of this invention, equipping the front face of a fixing roll with an elastic layer is the point that they are not indispensable requirements.

[0068] As shown in drawing 4 , the exfoliation sheet 13 of this operation form The polyimide film with a thickness of 40 micrometers with which the fluorine system resin layer 19 with a thickness of 10 micrometers was formed in the one side is made into a base material 18. Field 19a in which the fluororesin layer 19 was formed in the base material 18 is carried out outside, and it is arranged so that point 13a of the side in which the fold of the layered product was formed in the layered product which formed by making it double fold may turn to the nip section N. In addition, a base material 18 is not restricted to a polyimide film, and a heat-resistant sheet plastic or a metal sheet can be used for it.

[0069] The thickness of the exfoliation sheet 13 used as the layered product is about 100 micrometers, some swelling formed by having folded the exfoliation sheet 13 in two exists in edge 13a by the side of the nip section N, and the portion of this swelling forms the contact section 15 in contact with the fixing roll 1 in it. The thickness of the exfoliation sheet 13 in this about 15 contact section is about 110 micrometers.

[0070] Other-end marginal 13b of the ablation sheet 13 has pasted up, as the base material 18 folded in two put the support plate 14. The length from edge 13a by the side of the nip section N of the ablation sheet 13 to edge 13b of the side currently supported on the support plate 14 is 5mm. The width of face of fixing roll 1 shaft orientations of the ablation sheet 13 is set as the width of face which covers the whole form width of face to pass. The ablation sheet 13 is in the state supported by the support plate 14, and it is arranged so that the contact section 15 formed near [the] the edge 13a may be pressed to the fixing roll 1.

[0071] The detachability ability of the exfoliation sheet 13 of this operation form is the same as that of the detachability ability of the exfoliation sheet 7 (refer to drawing 1) in the 1st operation form almost.

[0072] In the fixing equipment of this operation form, there is a possibility that the contact section 15 of the exfoliation sheet 13 may touch the fixing roll 1, and the offset toner on the fixing roll 1 may adhere to the exfoliation sheet 13. Then, exfoliation sheet 13 front face is covered with the good fluorine system resin layer 19 of a mold-release characteristic so that an offset toner cannot adhere to the exfoliation sheet 13 easily.

[0073] Here, how the exfoliation sheet which covered the front face of the point of an exfoliation sheet with the fluorine system resin layer is produced poses a problem. Although how to cut the sheet-like polyimide base material which covered the fluorine system resin as the easiest production method, and use as the exfoliation sheet of predetermined size can be considered, since a fluorine system resin does not exist in the cutting plane of a base material by this method, it adheres [a toner / tend] to the portion and is not desirable. Moreover, although how to cover a fluorine system resin to each base material is also considered after preparing the base material cut in predetermined size by cutting, the part where a fluorine system resin cannot be easily covered with this method by a cutting plane, especially the edge section, and the fluorine system resin is not locally covered with it may be made.

[0074] On the other hand, with the exfoliation sheet 13 produced by the double fold method of this operation form shown in drawing 4, the fluorine system resin layer 19 of predetermined thickness is formed also in edge 13a by the side of the nip section N of the exfoliation sheet 13, and adhesion of a toner is prevented. Moreover, since it is produced by the double fold method, the edge which sharpened in edge 13a is not formed, and it has become a pile configuration about the offset toner at scraping. Therefore, when the toner image on Form P (refer to drawing 1) offsets in large quantities on the fixing roll 1, almost all offset toner and paper powder will rotate one time, adhered to the fixing roll 1, and it will be away held by Form P after that, and it is prevented that the exfoliation sheet 13 becomes dirty. Since the nose of cam of the form P supplied to the nip section N next contacts the toner and paper powder which were accumulated at edge 13a and has outside the plane away even if some of offset toners and paper powder may be accumulated temporarily at edge 13a of the exfoliation sheet 13, the dirt of the exfoliation sheet 13 is prevented.

[0075] The exfoliation sheet 13 of this operation form has the advantage of being

hard to attach a blemish to the toner image surface though the toner image T on Form P is ground against the nose of cam of the exfoliation sheet 13 in case it exfoliates since point 13a has smooth and big curvature. Moreover, since it is the same, the exfoliation sheet 13 of this operation form has structure which cannot attach a blemish easily to the fixing roll 1. Furthermore, with curvature with this exfoliation sheet 13 big nose of cam, the probability that the nose of cam of Form P will collide head-on with the nose of cam of the exfoliation sheet 13 can decrease, it can be stabilized more, and Form P can be exfoliated.

[0076] For the above reason, 70g [in / the 1st fixing equipment / in the maximum ablation force i.e., the critical load which can stabilize and exfoliate, in which it explained with reference to Table 2] can be raised even to 150g with this operation gestalt. Therefore, in this operation gestalt, it is not necessary to necessarily form an elastic layer in the front face of the fixing roll 1.

[0077] Furthermore, with the ablation sheet of this double fold method, heating at the heater built in the fixing roll 1 becomes a cause, and the merit of being hard to generate the flapping phenomenon which is easy to generate in the edge of an ablation sheet also has it. a contact pressure [actually as opposed to the fixing roll 1 of the ablation sheet 13] -- about [of the contact pressure in the case of the ablation sheet 7 (refer to drawing 2) of a monolayer] -- it is confirmed that lenticulate even if it makes it decrease even to one half, and a phenomenon does not arise, and it is possible to reduce the contact pressure in the case of being A4 horizontal size form width-of-face:297mm even to 30g

[0078] If the point S that the form P which passed the exfoliation point S N, i.e., the nip section, with which the exfoliation sheet 13 exfoliates from the fixing roll 1 exfoliated from the fixing roll 1 separated from the outlet of the nip section N and it has passed, since the time supported while Form P had coiled around the fixing roll 1 will become long, the point of the toner picture on Form P may be overheated, a gross may become high, and gross nonuniformity may produce in the point of

[0079] At the time of the usual image formation, there is a non-image formation field in which a picture is not formed at the nose of cam of the form which supported the toner picture. The length from the form nose of cam of this non-image formation field is about about 5mm, although there are some differences with image formation equipment. In process in which a form comes out from the nip section, if a form nose of cam begins to exfoliate with the exfoliation sheet 13 before the nose of cam of a toner picture comes out of the nip section, the above-mentioned gross nonuniformity will not be produced.

[0080] then, the gross nonuniformity which boils and changes various positions

of the exfoliation point S, and is generated at the nose of cam of a toner picture was investigated. The result is shown in Table 4. Here, the nip width of face of the fixing roll 1 and a pressure roll 6 is 6mm.

[0081]

[Table 4]

	ニップ出口から剥離ポイントまでの距離				
	3 mm	4 mm	5 mm	6 mm	7 mm
グロスマラ	○	○	○	×	×

[0082] If the distance from the outlet of the nip section N to the exfoliation point S becomes longer than length 5mm of the non-image formation field of a form so that clearly from Table 4, gross nonuniformity will begin to arise in the point of a toner picture. If the distance from the outlet of the nip section N to the exfoliation point S is 6mm or less, the problem of gross nonuniformity will not occur.

[0083] That is, in order to prevent generating of gross nonuniformity, it is desirable to make a form the distance from a nip section outlet exfoliate from the 1st body of revolution (fixing roll) in a position shorter than the length of the non-image formation field at the nose of cam of a form.

[0084] In addition, you may use the following exfoliation sheets as a modification of the 2nd operation form.

[0085] Drawing 5 is drawing showing the modification of the exfoliation sheet shown in drawing 4.

[0086] As shown in drawing 5, this exfoliation sheet 13' The heat-resistant sheet plastic or metal sheet with which the fluorine system resin layer 19 was formed in one side as well as the exfoliation sheet 13 shown in drawing 4 is made into a base material 18. It is formed as a layered product which folded in half by ****ing outside the field in which the fluorine system resin layer 19 was formed in the base material 18. among these base-material 18 folded in half a diameter -- five -- -- 100 -- micrometer -- a globular form -- or -- a cylindrical shape -- a particle -- 20 -- intervening -- making -- things -- exfoliation -- a sheet -- 13 -- ' -- a fold -- forming -- having had -- a side -- the edge -- 13 -- a -- ' -- having met -- a swelling -- it can do -- drawing 4 -- being shown -- exfoliation -- a sheet -- 13 -- it can set -- contact -- the section -- 15 -- oversized -- contact -- the section -- 15 A particle 20 is put among base-material 18 folded in half at intervals of 10mm along with edge 13a[of exfoliation sheet 13']. In addition, you may make

it paste up base-material 18 folded in half by the binder. Thus, constituted exfoliation sheet 13' has the same detachability ability as the exfoliation sheet 13 shown in drawing 4.

[0087] Next, the 3rd operation gestalt of the fixing equipment of this invention is explained.

[0088] When continuation fixing operation of hundreds of sheets is made to perform using the fixing equipment of the 1st or 2nd operation gestalt, the offset toner and paper powder of an amount may be accumulated a little temporarily at the edge of an ablation sheet, and the phenomenon in which they are removed by the form point sent to the degree may be seen. Consequently, the nose of cam of a form will be soiled somewhat and is not desirable for picture quality. In such a case, it is desirable to use the ablation sheet of the 3rd operation gestalt explained below.

[0089] Drawing 6 is the cross section of the ablation sheet used for the 3rd operation gestalt of this invention.

[0090] As shown in drawing 6, the fluorine system resin layer 29 with a thickness of 10 micrometers is covered by the base material 28 of a polyimide film with a thickness of 75 micrometers, this ablation sheet 27 is formed in it, two or more salients 30 which have a cone type configuration with a height of 20 micrometers are formed in field 27b of the side which counters the fixing roll 1 of the ablation sheet 27, and the salient 30 of these plurality touches the fixing roll 1. Salient 30 is about 20 micrometers in height, and can be formed by making it push and deform plastically with a mold from field 27c of the opposite side of field 27b of the side which counters the fixing roll 1 of the ablation sheet 27. Thus, by making a base material 28 deform plastically and forming two or more salients, since it becomes possible to obtain the ablation sheet which has a salient comparatively easily and cheaply, it is desirable.

[0091] Drawing 7 is the plan of the ablation sheet shown in drawing 6.

[0092] As shown in drawing 7, the salient 30 is formed in field 27b of the side which counters the fixing roll 1 of the ablation sheet 27 at intervals of 10mm in parallel with fixing roll 1 shaft orientations.

[0093] Drawing 8 is the plan showing the modification of the ablation sheet of the 3rd operation gestalt, and drawing 9 is the plan showing other modifications of the ablation sheet of the 3rd operation gestalt.

[0094] drawing 8 -- being shown -- as -- ablation -- a sheet -- 27 -- ' -- a top -- plurality -- a salient -- 30 -- ' -- alternate -- arranging -- making -- things -- this invention -- fixing -- equipment -- being desirable -- a mode -- one -- a ** -- it is -- moreover -- drawing 9 -- being shown -- as -- ablation -- a sheet -- 27 -- " --

forming -- having had -- plurality -- a salient -- 30 -- " -- fixing -- a roll -- one -- a hand of cut -- meeting

[0095] Next, the interval of two or more salients which can be set in the 3rd operation gestalt is explained.

[0096] As shown in drawing 6, the ablation sheet 27 in the 3rd operation gestalt touches the fixing roll 1 by the salient 30 near the edge 27a, and is in the state where the about 20-micrometer gap was maintained between edge 27a of the ablation sheet 27, and the fixing roll 1. Since the ablation sheet 27 uses the thin film film as a base material 28, if its interval of salient 30 is too large, edge 27a of the ablation sheet 27 between salients will contact the fixing roll 1. In order to prevent this, as for the interval of salient 30, it is desirable to take into consideration balance with the thickness of the ablation sheet 27, and to be referred to as about 3-30mm. Next, the height of the salient from the ablation sheet front face in the 3rd operation gestalt is explained.

[0097] Various height of salient 30 is changed into Table 5 using the ablation sheet 27 shown in drawing 6, and the result which investigated about detachability ability is indicated to be accumulation dirt of the toner and paper powder to the ablation sheet 27 to it. As shown in drawing 6, since the salient 30 is formed near the edge 27a of the ablation sheet 27, the gap of edge 27a of the ablation sheet 27 and the fixing roll 1 is a grade [a little] smaller than the height of salient 30. If this gap becomes large, the form P which has passed the nip section N cannot enter between the ablation sheet 27 and the fixing roll 1, and cannot exfoliate from the fixing roll 1.

[0098]

[Table 5]

紙厚 : 100 μ

	剥離シートの端縁と定着ロールとの間隙						
	3 μ m	5 μ m	25 μ m	50 μ m	75 μ m	100 μ m	125 μ m
剥離フィルム の汚れ	Δ	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc
剥離性能	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\times

[0099] If the gap of edge 27a of the ablation sheet 27 and the fixing roll 1 is 100 micrometers or less as shown in Table 5, sufficient detachability ability can be demonstrated. Moreover, if the height of a salient is set to less than 5 micrometers, an offset toner, paper powder, etc. will begin to adhere [come] to

an ablation sheet gradually. Therefore, as for the gap of edge 27a of the ablation sheet 27, and the fixing roll 1, it is desirable to be referred to as 5 micrometers or more 100 micrometers or less.

[0100] In addition, in the 3rd operation gestalt, the salient formed in an ablation sheet may be a linear salient prolonged in the direction which meets the hand of cut of a fixing roll. By forming such a linear salient from near the point of an ablation sheet, the flexibility on the design to a delicate gap of the contact position of a salient and a fixing roll can be made to increase, and it is desirable.

[0101] In each above-mentioned operation gestalt, although the example using the roll as the 1st and 2nd body of revolution was explained, the 1st and 2nd body of revolution in the fixing equipment of this invention may not be restricted only to a roll, and may be belt type body of revolution.

[0102] Moreover, although the explanation in each above-mentioned operation gestalt has explained only the example which applied the ablation sheet of this invention to ablation of the form from the 1st body of revolution (fixing roll) In the image formation equipment in which a double-sided copy is possible, in case a double-sided copy is taken, it can apply like each above-mentioned operation gestalt also to ablation of the form from the 2nd body of revolution (with each above-mentioned operation gestalt, it is equivalent to a pressure roll 6).

[0103]

[Effect of the Invention] As explained above, according to the 1st fixing equipment of this invention, the 1st body of revolution By having formed the elastic layer in the front face, and having had the ablation sheet which the edge is contacted on the 1st body-of-revolution front face at the hand-of-cut downstream of the 1st body of revolution, and exfoliates a form from the 1st body of revolution rather than the nip section The non-established toner image with which a lot of toners were imprinted and formed like color fixing Moreover fixing equipment equipped with the ablation sheet which can perform ablation stabilized without doing an injury to a toner image, a form, and the 1st body of revolution is realizable, according to the 2nd fixing equipment of this invention While having the contact section which contacts the 1st body-of-revolution front face by the downstream of the 1st body of revolution rather than the nip section of the 1st body of revolution By having the configuration further prolonged in the upstream of the 1st body of revolution rather than the contact section, and having had the ablation sheet with which the point prolonged in the upstream has been arranged by separating a predetermined gap from the 1st body-of-revolution front face Fixing equipment equipped with the ablation sheet

which can stabilize and exfoliate the non-established toner image on the 1st front face of body of revolution can be realized without doing an injury to a toner image, a form, and the 1st body of revolution similarly in the 1st fixing equipment of this invention.

[Brief Description of the Drawings]

[Drawing 1] It is the outline block diagram of the 1st operation gestalt of the fixing equipment of this invention.

[Drawing 2] It is the cross section of the ablation sheet with which the fixing equipment of the 1st operation gestalt was equipped.

[Drawing 3] It is the outline block diagram of an ablation force measuring device.

[Drawing 4] It is the cross section of the ablation sheet used for the 2nd fixing equipment of this invention.

[Drawing 5] It is drawing showing the modification of the ablation sheet shown in drawing 4.

[Drawing 6] It is the cross section of the ablation sheet used for the 3rd operation gestalt of this invention.

[Drawing 7] It is the plan of the ablation sheet shown in drawing 6.

[Drawing 8] It is the plan showing the modification of the ablation sheet of the 3rd operation gestalt.

[Drawing 9] It is the plan showing other modifications of the ablation sheet of the 3rd operation gestalt.

[Drawing 10] It is the outline block diagram of conventional fixing equipment equipped with the compulsive ablation equipment by the ablation presser foot stitch tongue.

[Drawing 11] It is the outline block diagram of conventional fixing equipment equipped with the compulsive ablation equipment by the ablation sheet of plastics.

[Description of Notations]

1 Fixing Roll

2 Heater

3 Elastic Layer

4 Surface Layer

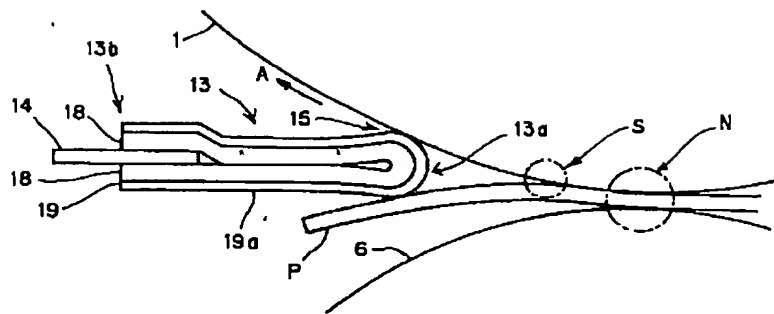
5 Core

6 Pressure Roll

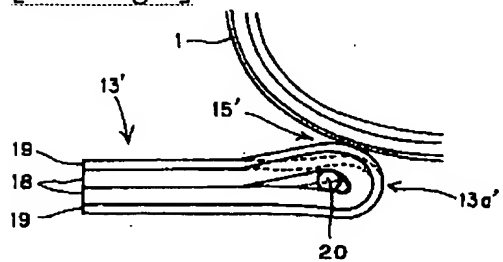
7 Ablation Sheet

7a Edge

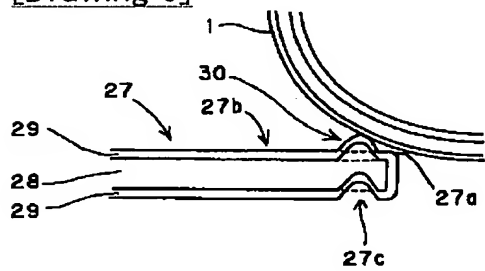
7b Back end section
8 Base Material
8a Front face
8b Rear face
8c Edge
9 Fluorine System Resin Layer
10 Ablation Presser Foot Stitch Tongue
11 Ablation Sheet
12 Support Plate
12a Point
12b Back end section
13 13' Ablation sheet
13a, 13a', 13b Edge
14 Support Plate
15 15' Contact section
18 Base Material
19 Fluorine System Resin Layer
19a Field
20 Particle
21 Fixing Roll
22 Heater
23 Ablation Presser Foot Stitch Tongue
23a Edge
24 Strain Gage
26 Pressure Roll
27, 27', 27" Ablation sheet
27a Edge
27b, 27c Field
28 Base Material
29 Fluorine System Resin Layer
30, 30', 30" Salient



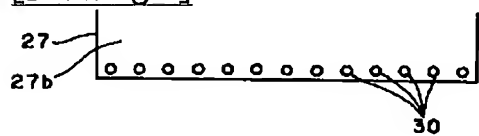
[Drawing 5]



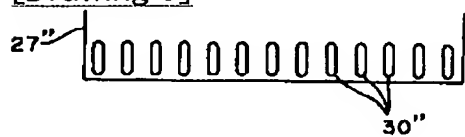
[Drawing 6]



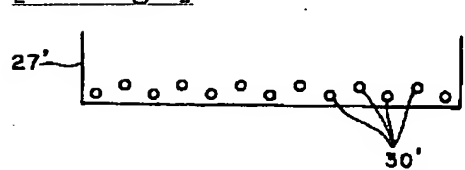
[Drawing 7]



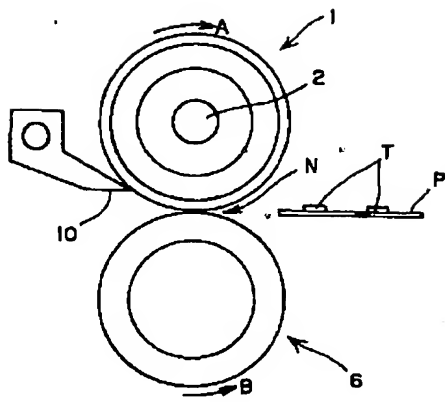
[Drawing 9]



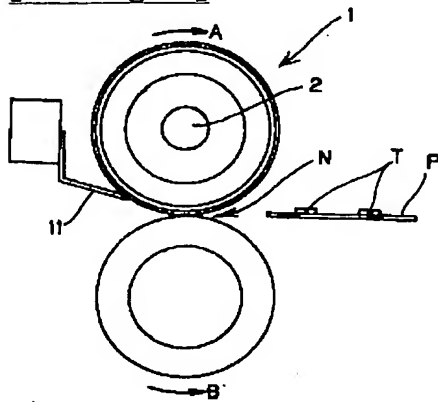
[Drawing 8]



[Drawing 10]



[Drawing 11]



[Translation done.]

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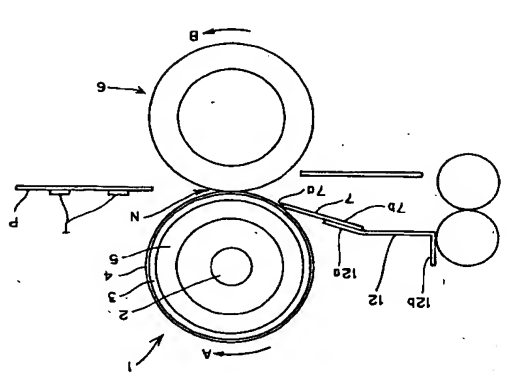
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(54) 発明の名称 定着装置

(57) 要約

【課題】 画像、用紙、および定着ロールに損傷を与え、ることなく安定した剥離を行うことのできる剥離シートを備えた定着装置を提供することを目的とする。

【解決手段】 表面に弾性層3が形成された、矢印A方向に回転する定着ロール1と、定着ロール1に接触しながら矢印B方向に回転する加圧ロール6と、ニップ部Nよりも定着ロール1の回転方向Aの下流側に備えられ、定着ロール1表面にその増縁が接触し、ニップ部Nを通過した用紙Pを定着ロール1表面から剥離するブラスタックの剥離シート7とを備えた定着装置。



【請求項7】 前記剥離シートが、片面にフッ素系樹脂層が形成された弾性プラスチックシートまたは金属シートを基材とし、該基材を前記フッ素系樹脂層が形成された面を外側に二つ折りにして形成した複層体を、該複層体の、折り目が形成された側の先端部が前記ニップ部を向くように配置してなるものであることを特徴とする請求項6記載の定着装置。

【請求項8】 前記剥離シートが、二つ折りされた基材どうしの間に介在させた球形または円筒形の粒子により、該複層体の、折り目が形成された側の端縁に沿って形成された突起を有するものであることを特徴とする請求項7記載の定着装置。

【請求項9】 前記剥離シートが、耐熱性プラスチックシートまたは金属シートを基材とし、該基材表面および前記ニップ部に向かう側の端縁にフッ素系樹脂層を形成したものであり、かつ、前記端縁部に、前記第1の回転体の軸方向に平行に形成された複層の突起が形成されてなるものであることを特徴とする請求項6記載の定着装置。

【請求項10】 前記増縁の突起が、円筒形の形状を有するものであることを特徴とする請求項9記載の定着装置。

【請求項11】 前記増縁の突起が、前記第1の回転体の回転方向に沿う方向に延びる筒状の形状を有するものであることを特徴とする請求項9記載の定着装置。

【請求項12】 前記増縁の突起が、5μm以上100μm以下の高さを有するものであることを特徴とする請求項9記載の定着装置。

【請求項13】 前記増縁の突起が、剥離シートの基材を塑性変形させて形成したものであることを特徴とする請求項9記載の定着装置。

【請求項14】 前記剥離シートが、前記ニップ部出口からの距離が用紙先端の非画像形成領域の長さよりも短い位置において前記第1の回転体から用紙を剥離するものであることを特徴とする請求項6記載の定着装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、電子複写機、フタクシミリなどの電子写真方式の画像記録装置に用いられる定着装置に関する。

【0002】

【従来の技術】 従来、電子複写機・フタクシミリなどの電子写真方式の画像記録装置において、用紙上に転写されたトナー像を定着させる定着装置として、定着ロールと加圧ロールからなる一対のロールのニップ部に、トナー像が転写された用紙を通過させて、定着ロールによる加熱と二つのロールによる加圧とによりトナー像を用紙に融着させる定着装置が広く用いられている。

【0003】 一般に、この定着方式では、用紙に融着したトナー像が定着ロールに接触するので、定着ロールと

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方向の屈曲全体に接触するだけの幅を有しており、剥離シート7は、その端縁7aが定着ロール1の表面に300gの圧接力で押し付けられるように、その後端部7bが金属製の支持プレート112の先端部12aに固定されている。支持プレート112は、その後端部12bが定着装置のフレーム7bにねじで固定されている。剥離シート7は、先端部の端縁7aから後端部7bまでの長さ2mm〜7mm程度と比較的短く形成されているので弾性シートであるにもかかわらず十分な弾性を確保されている。

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【0026】剥離シート7の端縁7aと定着ロール1との圧接力は、用紙P上のトナー像Tがニップ部Nに加圧されて溶融し定着ロール11に付着しようとするのを抑制するための剥離力に相当するものであり、剥離シート7は定着すべきトナー像および用紙の性状により決まる剥離力に相当する圧接力で定着ロール11に圧接されている必要がある。なお、剥離力の測定方法については後述する。また、剥離シート7と定着ロール1との圧接力は、上記の剥離力との関連性以外に次のような諸要素との関連性をも考慮して定められる。

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【0026】まず、圧接力の最小値は、加熱された剥離シート7の端縁7aに生じる変打りが消えるに十分な値でなければならず、また、圧接力の最大値は、剥離シートの境界たる質量や塑性変形開始荷重、または定着ロール11に傷が発生する境界以下の値でなければならぬ。これらの制約から、圧接力の実用上の最速値は、A4用紙サイズ用紙幅：297mmで100g〜500gの範囲内である。

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【0027】耐熱性プラスチックシートを剥離シート7の基材として用いた場合、この圧接力を得るための剥離シート7の厚さは50μm以上である必要がある。しかし、剥離シート7の厚さが150μm以上になると用紙Pが剥離シート7の端縁7aに突き当たってスラムズになり、剥離シート7の厚さが150μm以上になると、剥離力測定装置の駆動機構図である。

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【0034】図3に示すように、この剥離力測定装置は、実際の定着装置と同様、矢印A方向に回転する定着ロール21と、定着ロール21に接触しながら定着ロール21の回転方向Aとは反対方向Bに回転する加圧ロール26とを備えている。定着ロール21の内部には熱源としてヒータ22が配設されている。これら一対のロール21、26のニップ部Nに搬送されてきた、表面に未定着トナー像Tを担持する用紙Pを加熱するとともに加圧して未定着トナー像Tを用紙Pに定着する。

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【0035】定着ロール21のニップ部Nよりも定着ロール21の回転方向Aの下流側には、ニップ部Nを通じた用紙Pを定着ロール21表面から剥離する剥離爪23が備えられている。剥離爪23の端縁23aはすめ設定された圧接力で定着ロール21表面に押し付けられ、剥離爪23の裏面23bには歪みゲージ24が貼付されており、未定着トナー像Tを担持した用紙Pがニップ部Nを通して後の定着トナー像を剥離爪23で強制剥離する際の剥離爪23に作用する圧接力、すなわら

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剥離力を測定する。
【0036】具体的な測定条件としては、富士ゼロックス製A4サイズS紙上に幅100mm、長さ80mmの画像サイズでベタ未定着のテスト画像を形成し、このベタ未定着テスト画像を10℃程度の加熱温度に設定された定着ロール21により用紙搬送速度100mm/secで定着を行い、その時の剥離力を歪みゲージ24により検出する。その時の定着条件は次の通りである。
定着ロール：直径40mmのアルミニウムコアに厚さ20μmのPPFAチューブを被覆したフッ素系樹脂コートハートロール。
【0037】加圧ロール：直径34mmのアルミニウムコアに厚さ3mm、ゴム硬度60°のシリコンゴムを*【0041】

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1、表2、および表3に示す。
【0041】

【表1】					
* ギム硬度 60° のシリコンギムを *		トナー	トナー重量 (mg/cm ²)	画像光沢 (%)	最大剥離力 (g)
口黒定着 (フッ素樹脂P-4)	カラー定着 (フッ素樹脂P-4)	Vivace 350 トナー	0.65	9	10
		A Color トナー + Max	2.0	80	130
			1.3	68	90
				0.65	60
			0.65	15	17

【0042】表1に示すように、定着ロールとして、フッ素樹脂をコーティングした、いわゆるハードロールを用いた場合は、白黒定着においては、定着許容速度範囲において最大剥離力が10gであるのに対して、カラー定着においては最大剥離力が白黒定着の13倍の130gまで増大している。この最大剥離力の値は幅100mmのテスト画像に対する値であるから、A4用紙サイズの297mm幅のカラー画像を定着するには、剥離力の297mm幅のカラー画像が剥離シートに作用すること瞬時に約400gの衝撃力が剥離シートに作用することになる。そのため、厚さ75μmのポリイミド製の剥離シートが塑性変形してしまう恐れがあり、用紙の先端も大きな損傷を受けて変形したり紙端まりが発生する可能性がある。

【0043】本発明者らの実験によれば、用紙の先端が損傷を受けずに、また剥離シートの塑性変形やめくれが生じないで安定的に剥離できる境界荷重は幅100mmのテスト画像で70g、A4用紙サイズの297mm幅の算値では約200gであることが確かめられている。
【0044】また、表1に示した一連の実験結果より、単位面積当たりのトナー重量と最大剥離力とはほぼ比例関係にあることがわかる。また、カラートナーを十分発色させたいためにトナーに熱を十分に供給してトナー粘度を下げてトナーを溶融流動状態に近づけるに依り最大剥離

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【0047】しかし、その結果、画像光沢は80グロス(75°-75°測定)から白黒定着の場合と同程度の15グロス(75°-75°測定)まで低下してしまう。カラー画像の品質が大に劣化するもので、このような方策をとるわけにはいかない。

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【0048】そこで、本発明者らは剥離シートをカラー定着にも適用できるようにするため、定着ロールについて検討を行った。まず、定着ロールの表面構造に着目して、表面にフッ素系樹脂層が形成された、いわゆるハードロールと、表面に弾性層が形成された、いわゆるソフトロールとの剥離力の比較を行った。測定装置には図3に示した剥離力測定装置を用いた。

【0049】表2は、定着ロールとして、直径40mmのアルミニウム製コアに弾性層として厚さ0.1mm～1.0mm、ゴム硬度25°のシリコーンLSRゴムを被覆し、さらにその弾性層表面にフッ素系樹脂層を被覆した、いわゆるソフトロールを用いてカラー定着を行う。

カラー定着 (シリコーン弾性層 + フッ素樹脂表面 層の弾性体 $n=1$)	トナー + Max (2.0mg/cm ²)	弾性層厚さ (mm)	表面層厚さ (μ m)	最大剥離力 (g)
		0		130
		0.15	20	90
		0.30 (PFMA ²)		65
		0.50		60
		1.0		55

【0051】表2に示すように、定着ロールの弾性層(シリコーンゴム)の厚さが0.3mm未満である場合は最大剥離力は前述の境界荷重：70gを超えているが、弾性層の厚さが0.3mm以上である場合は最大剥離力を、安定して剥離することのできる境界荷重：70g以下のレベルに低下させることができる。

【0052】従って、従来のソフトロールでは、弾性層の厚さを2mm～3mm程度まで増加させて剥離力を10g程度以下にまで低下させてセルフストリッピングによる剥離を行っていたものを、本発明では0.3mm程度の薄い弾性層を有するソフトロールとすることができ、通常、弾性層は熱伝導率が低いのでソフトロールの弾性層の厚さを薄くすることが可能となつたことにより、定着ロール内部に備えられる熱源を小さくすることができ、また定着ロールの径も小さくなるので定着装置を小型化することが可能となる。

【0053】以上説明したように、表面に弾性層が形成された定着ロールを用いることにより、剥離力を大幅に低減できることがわかる。また、剥離力を用紙と弾性シートに損傷を与えない境界荷重：70g以下に低下させることが可能であり、カラー画像記録装置の定着装置に剥離シートを適用することができる。

【0054】定着ロール表面に弾性層を被覆することにより、剥離力が低下するメカニズムについては、ニップ内部では弾性層がトナー像を包み込むように変形しており、ニップ出口で圧力が開放された際に弾性体変形が元に戻ろうとしてトナー像と弾性体の界面でマクロスリップが起これ、このマクロスリップが剥離を低減させるためであると考えられる。従って、剥離力を低減するのに必要な弾性層の厚さは、用紙上のトナー層厚さを弾性層で吸収してトナーを包み込むように弾性層が変形できる厚さということになる。ニップ内部で弾性層が

【0050】表2は、定着ロールとして、直径40mmのアルミニウム製コアに弾性層として厚さ0.1mm～1.0mm、ゴム硬度25°のシリコーンLSRゴムを被覆し、さらにその弾性層表面にフッ素系樹脂層を被覆した、いわゆるソフトロールを用いてカラー定着を行う。

【0051】表2に示すように、定着ロールの弾性層(シリコーンゴム)の厚さが0.3mm未満である場合は最大剥離力は前述の境界荷重：70gを超えているが、弾性層の厚さが0.3mm以上である場合は最大剥離力を、安定して剥離することのできる境界荷重：70g以下のレベルに低下させることができる。

【0052】従って、従来のソフトロールでは、弾性層の厚さを2mm～3mm程度まで増加させて剥離力を10g程度以下にまで低下させてセルフストリッピングによる剥離を行っていたものを、本発明では0.3mm程度の薄い弾性層を有するソフトロールとすることができ、通常、弾性層は熱伝導率が低いのでソフトロールの弾性層の厚さを薄くすることが可能となつたことにより、定着ロール内部に備えられる熱源を小さくすることができ、また定着ロールの径も小さくなるので定着装置を小型化することが可能となる。

【0053】以上説明したように、表面に弾性層が形成された定着ロールを用いることにより、剥離力を大幅に低減できることがわかる。また、剥離力を用紙と弾性シートに損傷を与えない境界荷重：70g以下に低下させることが可能であり、カラー画像記録装置の定着装置に剥離シートを適用することができる。

【0054】定着ロール表面に弾性層を被覆することにより、剥離力が低下するメカニズムについては、ニップ内部では弾性層がトナー像を包み込むように変形しており、ニップ出口で圧力が開放された際に弾性体変形が元に戻ろうとしてトナー像と弾性体の界面でマクロスリップが起これ、このマクロスリップが剥離を低減させるためであると考えられる。従って、剥離力を低減するのに必要な弾性層の厚さは、用紙上のトナー層厚さを弾性層で吸収してトナーを包み込むように弾性層が変形できる厚さということになる。ニップ内部で弾性層が

加圧された際にトナー層厚さが弾性体層の厚さの10%以内であればトナー層厚さを吸収することができ、カラー画像形成の場合の最大トナー層厚さが約30 μ mであることを考えると、必要な弾性層の厚さは0.3mm以上ということになる。

【0055】ところで、弾性層表面にフッ素系樹脂層が形成された場合には、そのフッ素系樹脂層が弾性変形を妨げる方向に作用するが、フッ素系樹脂層の厚さがトナー層厚さ以下、つまり約30 μ m以下であれば、弾性体のトナー層厚さ吸収能力を低下させることは少ない。

【0056】以上のことから、弾性層の厚さは0.3mm以上であればよく、また、弾性層表面にフッ素系樹脂層を被覆した場合はその厚さが0.03mm以下であれば、カラー定着の場合でも、剥離力を剥離シートの適用可能な値以下に低下させることができ、画像、用紙、および定着ロールに損傷を与えずに安定した剥離を行うことができる定着装置を実現することができる。

【0057】表3は、定着ロールとして、直径40mmのアルミニウム製コアに弾性層として厚さ0.3mmのシリコーンゴムを被覆しただけのソフトロールを用いてカラー定着を行った場合の剥離力の測定結果である。測定装置には図3に示した剥離力測定装置を用いた。

【0058】この場合は、表2の定着ロールのようなフッ素樹脂の表面層を有していないため、定着ロールの表面にオイルを全く供給しない時にはシリコーンゴムの表面が短時間で摩耗してしまい実用に耐えられない。そこで、1mg/A4サイズ紙～10mg/A4サイズ紙のオイルを定着ロール表面に供給しながら定着を行い剥離力を測定した。

【0059】
【表3】

カラー定着 (シリコーン弾性層 だけの弾性体 $n=1$)	トナー + Max (2.0mg/cm ²)	最大剥離力 オイル供給量 (mg/A4サイズ紙)			
		0	1	5	10
		65g (摩耗)	20g	5g	1g

【0060】表3に示すように、オイル供給量がゼロの場合は剥離力：65gの測定値が得られるものの、オイルを供給しないまま定着を続けるとシリコーンゴムの摩耗により画像劣化を引き起こしてしまうのでこの条件では定着を行うわけにはいかない。しかし、1mg/A4サイズ紙程度のわずかなオイルを定着ロール表面に供給することによってシリコーンゴムの摩耗を防止し、かつ大幅に剥離力を低下させることができる。さらにオイル供給量を増加させて従来のカラー定着と同程度の10mg/A4サイズ紙のオイル供給量とすると、セルフストリッピングに近い領域まで剥離力を低下させることができ、オイル供給量が多くなると剥離シートがオイルを強く吸ってしまい剥離シートの先端がオイルで濡れて、それが用紙先端に転写され、オイルしみというトラブルが発生する恐れがある。そのため、剥離シートを備えた定着装置の場合はオイル供給量を実用上1mg/A4サイズ紙以下とする必要がある。表3に示すように、オイル供給量が1mg/A4サイズ紙の場合でも剥離力は20gであり、剥離シートを適用することが可能である。

【0061】このように、弾性層表面にフッ素系樹脂層が形成されておらず弾性層のみが形成された定着ロールでも、少量のオイルを定着ロール表面に供給することにより剥離力を低下させると、オイルが定着ロール内部にしみ込んで弾性層を低下させたり、オイルの補給用の設備が必要であったり、コピー上にオイル残りやボールペンやインクによる加減性を低下させるなどの問題を起こしやういので、表2に示したように、定着ロールの弾性層表面にフッ素系樹脂層が形成された定着ロールを用いることが好ましい。

【0062】なお、弾性層表面にフッ素系樹脂層を有する定着ロールの場合でも、1mg/A4サイズ紙のオイルを供給することによって剥離力を約半分に低減させることが可能である。この場合も、オイルしみのトラブルを避けるために、オイル供給量は1mg/A4サイズ紙以下に設定することが好ましい。

【0063】次に、本発明の第2の定着装置の実施形態について説明する。

【0064】図4は、本発明の第2の定着装置に用いられる剥離シートの断面図である。

【0065】図4には、本発明の第2の定着装置に用いられる剥離シート13が示されている。本発明の第2の定着装置は、本発明の第1の定着装置と同様、内部に熱源を有し所定の方向に回転する第1の回転体と、第1の回転体に接触しながら第1の回転体の回転方向とは反対の方向に回転する第2の回転体とを備え、これら2つの回転体が互いに接触してなるニップ部に搬送されてきた、第1の回転体に接触する側の表面に未定着トナー像を相対する用紙を加圧するとともに加圧して、未定着トナー像を用紙に定着するものであるが、本発明の第2の定着装置は次の2点において本発明の第1の定着装置と相違している。

【0066】第1の相違点は、本発明の第2の定着装置に備えられた剥離シート13の構成および作用が本発明の第1の定着装置に備えられた剥離シート7(図1参照)と相違している点である。すなわち、本発明の第2の定着装置に備えられた剥離シート13は、定着ロール1(第1の回転体)の、ニップ部Nよりも第1の回転体1の回転方向Aの下流側で定着ロール1表面と接触する接触部15を有するとともに、接触部15よりもさらに定着ロール1の回転方向Aの上流側に延びた形状を有し、その上流側に延びた先端部13aが定着ロール1表面から所定の距離を隔てて配置されている。

【0067】第2の相違点は、本発明の第1の定着装置においては定着ロールの表面に形成された弾性層3(図1参照)を備えることが必要要件であったが、本発明の第2の定着装置では、定着ロールの表面に弾性層を備えることは必要要件ではないという点である。

【0068】図4に示すように、本実施形態の剥離シート13は、その片面に10 μ mの厚さのフッ素系樹脂層19が形成された、厚さ40 μ mのポリイミドフィルムを基材18とし、基材18を折り曲げて形成された溝部19aを外面にして二つ折りにして形成した溝部19aを、その溝部19aの折り目が形成された側の先端部13aがニップ部Nを向くように配置されている。なお、基材18は、ポリイミドフィルムに限られるものではなく、耐熱性プラスチックシートまたは金属シートを用い

ることができ、

[0069] 積層体となった剥離シート13の厚さは約100μmであり、ニップ部NN側の端縁13aには、剥離シート13が二つ折りされたことにより形成された若干の膨らみが存在し、この膨らみの部分が定着ロール15に接触する領域部15を形成している。この領域部15に近傍における剥離シート13の厚さは110μm程度である。

[0070] 剥離シート13の他方の端縁13bは、二つ折りにされた基材18が支持プレート14を挟み込むようにして接合されている。剥離シート13のニップ部NN側の端縁13aから、支持プレート14で支持されている側の端縁13bまでの長さは5mmである。剥離シート13の定着ロール14の方向の幅は、通過する用紙幅全体をカバーする様に設定されている。剥離シート13は、支持プレート14に支持された状態で、その端縁13a近傍に形成された接触部15が定着ロール15に対して押圧されるように配置される。

[0071] 本実施形態の剥離シート13の剛性性能は、第1の実施形態における剥離シート7（図1参照）の剛性性能とほぼ同様である。

[0072] 本実施形態の定着装置においては、剥離シート13の接触部15が定着ロール15に接触しており定着ロール15上のオフセットトナーが剥離シート13に付着する恐れがある。そこで、オフセットトナーが剥離シート13に付着しにくいように、剥離シート13表面は剛性型のフッ素系樹脂層19で被覆されている。

[0073] ここで、剥離シート13の先端部をフッ素系樹脂層で被覆した剥離シートを如何にして作製するかが問題となる。最も簡単な作製方法として、フッ素系樹脂を被覆したシート状ポリイミド基材を切断して所定サイズの剥離シートとする方法が考えられるが、この方法では基材の切断面にフッ素系樹脂が存在しないのでその部分にトナーが付着しやすくなり、また、カッティングにより所定のサイズに切断した基材を用意した後に、個々の基材にフッ素系樹脂を被覆する方法も考えられるが、この方法では、切断面、特にエッジ部にフッ素系樹脂が被覆されにくく、局所的にフッ素系樹脂が被覆されていない箇所ができてしまうことがある。

[0074] これに対して、図4に示した本実施形態は、二つ折り方式により作製された剥離シート13である。剥離シート13のニップ部NN側の端縁13aにも所定の厚さのフッ素系樹脂層19が形成されておりトナーの付着が防止される。また、二つ折り方式で作製されているため、端縁13aに尖ったエッジが形成されることなく、オフセットトナーを極き取りにくい形状となっている。従って、用紙P（図1参照）上のトナー像が定着ロール15に大量にオフセットした場合においても、ほとんどオフセットトナーや紙粉は定着ロール15に付着したまま1回転し、その後用紙Pによって持ち去られる

ことになり、剥離シート13が汚れることが防止される。一部のオフセットトナーや紙粉が一時的に剥離シート13の端縁13aに蓄積されることがあっても、次にニップ部NNに供給されてきた用紙Pの先端が、端縁13aに蓄積されたトナーや紙粉に接触して機外に持ち去るので剥離シート13の汚れは防止される。

[0075] 本実施形態の剥離シート13は、先端部13aが滑らかで大きな曲率を持っているため、用紙P上のトナー像Tを剥離する際に剥離シート13の先端で積ったとしてもトナー像面に傷を付けないという利点がある。また、同様の理由から、本実施形態の剥離シート13は、定着ロール15に対して傷を付けにくい構造となっている。さらに、この剥離シート13の先端の大きな曲率により、用紙Pの先端が剥離シート13の先端と正面衝突する機会が減少し、より安定して用紙Pを剥離することができ、

[0076] 以上の理由により、表2を参照して説明した、最大剛性力、すなわち、安定して剥離することのできる限界荷重を第1の定着装置における70gを、本実施形態では150gにまで向上させることができる。従って、本実施形態においては、必ずしも定着ロール15の表面に弾性層を形成する必要がある。

[0077] さらに、この二つ折り方式の剥離シートでは、定着ロール15に内蔵されたヒータによる加熱が原因となっており剥離シート13の端縁に発生しやすい破損現象が、剥離シート13の定着ロール15に対する圧力を、出側の剥離シート7（図2参照）の場合の圧力の約1/2にまで減少させても破損現象が生じないことが確かめられており、A4サイズ用紙幅：297mmの場合の圧力を30gにまで低下させることが可能である。

[0078] 剥離シート13が定着ロール15から剥離する剥離ポイントS、すなわちニップ部NNを通過した用紙Pが定着ロール15から剥離する点Sが、ニップ部NNの出口から離れて過ぎていると、用紙Pが定着ロール15をき付いたまま担持される時間が長くなるので、用紙P上のトナー画像の先端部が通熱されてグロスラを高く、トナー画像の先端部にグロスラを生じることがある。

[0079] トナー画像を担持した用紙の先端には、通常茶の画像形成時には画像が形成されない非画像形成領域がある。この非画像形成領域の用紙先端からの長さは画像形成装置により多少の差はあるが約5mm程度である。用紙がニップ部から出てくる過程において、トナー画像の先端がニップ部から出る前に、用紙先端が剥離シート13により剥離されれば、上記のグロスラを生じることがない。

[0080] ここで、剥離ポイントSの位置を種々に変えてトナー画像の先端に発生するグロスラを観望した。その結果を表4に示す。ここで、定着ロール15に加圧ロール6のニップ幅は6mmである。

[0081]

グロスラ	ニップ出口から剥離ポイントまでの距離					
	3mm	4mm	5mm	6mm	7mm	
○	○	○	○	×	×	×

[0082] 表4から明らかのように、ニップ部NNの出口から剥離ポイントSまでの距離が、用紙の非画像形成領域の長さ：5mmより長くなるとトナー画像の先端部にグロスラが発生し始める。ニップ部NNの出口から剥離ポイントSまでの距離が6mm以下であればグロスラの発生は防止される。

[0083] すなわち、グロスラの発生を防止するために、ニップ部出口からの距離が、用紙先端の非画像形成領域の長さよりも短い位置において第1の回転体（定着ロール）から用紙を剥離するようにすることが好ましい。

[0084] なお、第2の実施形態の変形例として次のような剥離シートを用いてもよい。

[0085] 図5は、図4に示す剥離シートの変形例を示す図である。

[0086] 図5に示すように、この剥離シート13'は、図4に示す剥離シート13と同様、片面にフッ素系樹脂層19が形成された面側にフッ素系樹脂層19が形成された面を側面に二つ折りした構造体として形成されており、この二つ折りされた基材18どうしの間に、直径5〜100μmの球形または円筒形の粒子2を介在させることにより、剥離シート13'の折目部分が形成された側の端縁13a'に沿った断面積が、図4に示す剥離シート13における端縁部15よりも大きな端縁部15'が形成される。粒子20は、剥離シート13'の端縁13a'に沿って10mm間隔で二つ折りされた基材18どうしの間に挟み込まれる。なお、二つ折りされた基材18どうしを被覆材により被覆するようにしてもよい。このように構成した剥離シート13'は、図4に示す剥離シート13と同様の剥離性能を有している。

[0087] 次に、本発明の定着装置の第3の実施形態について説明する。

[0088] 第1あるいは第2の実施形態の定着装置を用いて数枚の連続定着動作を行わせると、剥離シート13の端縁に若干量のオフセットトナーや紙粉が蓄積され、それらが、皿に送られてきた用紙先端部に覆り除かれるという現象が見られることがある。その結果、用紙の先端が多少汚れることになり、画像品質とって好ましいことではない。このような場合には、次に説明する第3の実施形態の剥離シートを用いることが望ましい。

[0091] 図7は、図6に示す剥離シートの平面図である。

[0092] 図7に示すように、突起30は、剥離シート27の定着ロール15に対向する側の面27bに、定着ロール15の回転方向に並行に10mmの間隔で形成されている。

[0093] 図8は、第3の実施形態の剥離シートの変形例を示す平面図であり、図9は、第3の実施形態の剥離シートの他の変形例を示す平面図である。

[0094] 図8に示すように、剥離シート27'上の複数の突起30'を千鳥状に配列させることも本発明の定着装置の好ましい態様の一つであり、また、図9に示すように、剥離シート27'に形成された複数の突起30'が、定着ロール15の回転方向に沿う方向に延びた薄片型の形状を有するものとすることも本発明の定着装置の好ましい態様である。

[0095] 次に、第3の実施形態における突起の突起30'の厚さとのバランスを調整して3〜30mm程度とするために、突起30'どうしの間隔は、突起30'の幅と

[0089] 図6は、本発明の第3の実施形態に用いられる剥離シートの断面図である。

[0090] 図6に示すように、この剥離シート27は、厚さ75μmのポリイミドフィルム28の基材28に厚さ10μmのフッ素系樹脂層29が被覆されて形成されており、剥離シート27の、定着ロール15に対向する側の面27bに高さ20μmの円錐型の突起30が定着ロール15に接触している。突起30は、高さ約20μmであり、剥離シート27の定着ロール15に対向する側の面27bの反対側の面27cから型で押し出された形状に形成することができ、このように、突起30を塑性変形させて複数の突起を形成することにより、比較的容易かつ安価に突起を有する剥離シートを得ることが可能となるので好ましい。

[0091] 図7は、図6に示す剥離シートの平面図である。

[0092] 図7に示すように、突起30は、剥離シート27の定着ロール15に対向する側の面27bに、定着ロール15の回転方向に並行に10mmの間隔で形成されている。

[0093] 図8は、第3の実施形態の剥離シートの変形例を示す平面図であり、図9は、第3の実施形態の剥離シートの他の変形例を示す平面図である。

[0094] 図8に示すように、剥離シート27'上の複数の突起30'を千鳥状に配列させることも本発明の定着装置の好ましい態様の一つであり、また、図9に示すように、剥離シート27'に形成された複数の突起30'が、定着ロール15の回転方向に沿う方向に延びた薄片型の形状を有するものとすることも本発明の定着装置の好ましい態様である。

[0095] 次に、第3の実施形態における突起の突起30'の厚さとのバランスを調整して3〜30mm程度とするために、突起30'どうしの間隔は、突起30'の幅と

[0096] 図6に示すように、第3の実施形態における剥離シート27は、端縁27a近傍の突起30'で定着ロール15に接触しており、剥離シート27の端縁27aと定着ロール15の間には20μm程度の隙間が保たれた状態となっている。剥離シート27は薄膜フィルムを基材28として用いているため、突起30'どうしの間隔が広くなると、突起と突起との間の剥離シート27の端縁27aが定着ロール15に接触してしまう。これを防止するために、突起30'どうしの間隔は、剥離シート27の厚さとのバランスを調整して3〜30mm程度とする

紙厚 : 100 μ		紙厚 : 100 μ	
125 μ	○	○	×
100 μ	○	○	○
75 μ	○	○	○
50 μ	○	○	○
25 μ	○	○	○
5 μ	○	○	○
3 μ	△	○	○
製造工程		製造工程	

ることが望ましい。次に、第3の実施形態における剥離シート表面からの突起の高さについて説明する。
【0097】表5には、図6に示す剥離シート27を用いて突起30の高さを種々変更して剥離シート27へのトナー・紙粉の蓄積汚れと、剥離性能について調査を行った結果が示されている。図6に示すように、突起30は剥離シート27の端縁27aの近傍に形成されているため、剥離シート27の端縁27aと定着ロール1との間隙は、突起30の高さより若干小さい程度である。この間隙が大きくなると、ニップ部Nを通過してきた用紙Pが剥離シート27と定着ロール1の間に入り込んでしまい定着ロール1から剥離することができない。
【0098】
【表5】

【0099】表5に示すように、剥離シート27の端縁27aと定着ロール1との間隙が100 μm以下であれば十分な剥離性能を確保することができる。また、突起の高さが5 μm未満になるとオフセットトナーや紙粉などが剥離シートに徐々に付着し始めるようになる。従って、剥離シート27の端縁27aと定着ロール1との間隙は5 μm以上100 μm以下とすることが好ましい。
【0100】なお、第3の実施形態において、剥離シートに形成する突起は、定着ロールの回転方向に沿う方向に延びた線状の突起であってよい。このような線状の

【図7】図6に示す剥離シートの平面図である。
【図8】第3の実施形態の剥離シートの変形例を示す平面図である。
【図9】第3の実施形態の剥離シートの他の変形例を示す平面図である。
【図10】剥離爪による強制剥離装置を備えた従来の定着装置の概略構成図である。
【図11】プラスチックの剥離シートによる強制剥離装置を備えた従来の定着装置の概略構成図である。

【符号の説明】

- 10 定着ロール
- 1 ヒータ
- 2 弾性層
- 3 表面層
- 4 コア
- 5 加圧ロール
- 6 剥離シート
- 7a 後端部
- 7b 基材
- 8a 表面層
- 8b 弾性層
- 8c コア
- 9 フック系樹脂層
- 10 剥離爪
- 11 剥離シート
- 12 支持プレート
- 12a 先端部
- 12b 後端部
- 13, 13' 剥離シート
- 13a, 13a', 13b' 端縁
- 14 支持プレート
- 15, 15' 接触部
- 18 基材
- 19 フック系樹脂層
- 19a 面
- 20 板子
- 21 定着ロール
- 22 ヒータ
- 23 剥離爪
- 23a 端縁
- 24 圧みゲージ
- 26 加圧ロール
- 27, 27', 27'' 剥離シート
- 27a 端縁
- 27b, 27c 面
- 28 基材
- 29 フック系樹脂層
- 30, 30', 30'' 突起

突起は、剥離シートの先端部近傍から形成するようにすることにより、突起と定着ロールとの接触位置の微妙なずれに対する設計上の自由度を増加させることができ好ましい。
【0101】上記の各実施形態においては、第1および第2の回転体としてロールを用いた例について説明したが、本発明の定着装置における第1および第2の回転体はロールのみに限られるものではなく、例えばベルト型の回転体であってもよい。

【0102】また、上記の各実施形態における説明では、本発明の剥離シートを、第1の回転体（定着ロール）からの用紙の剥離に適用した例についてのみ説明してきたが、両面コピーが可能な画像形成装置において、両面コピーを取る際に、第2の回転体（上記各実施形態では、加圧ロール6に相当する）からの用紙の剥離に対しては、上記各実施形態と同様に適用することができる。

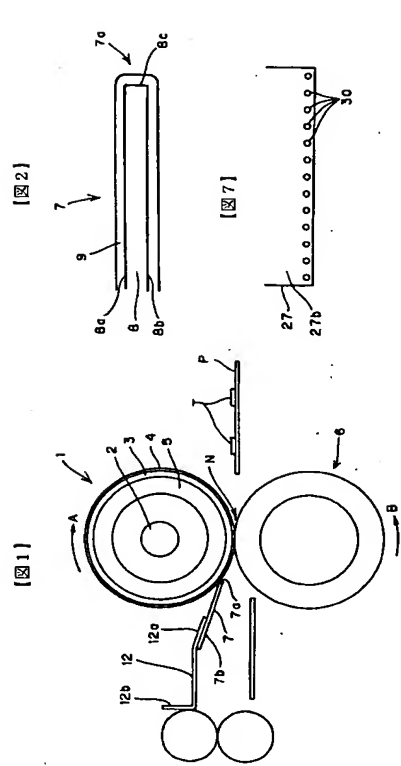
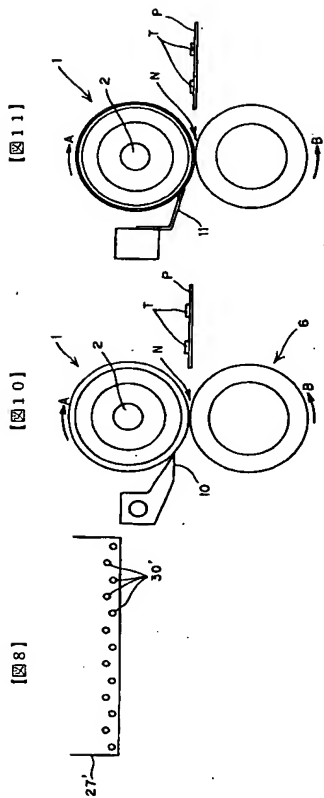
【0103】

【発明の効果】以上説明したように、本発明の第1の定着装置によれば、第1の回転体を、表面に弾性層が形成されたものとし、かつニップ部より第1の回転体の回転方向下流側に、第1の回転体表面にその端縁を接触させて第1の回転体から用紙を剥離する剥離シートを備えたことにより、カラー定着のように多数のトナーが転写されて形成された未定着トナー像を、トナー像、用紙および第1の回転体に損傷を与えずに安定した剥離を行うことのできる剥離シートを備えた定着装置を実現することができる。

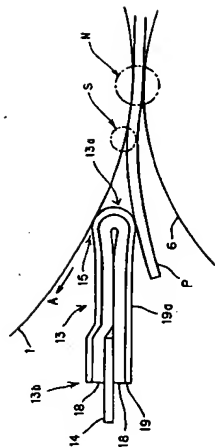
また、本発明の第2の定着装置によれば、第1の回転体の、ニップ部よりも第1の回転体の下流側で第1の回転体表面と接触する接触部を有するとともに、接触部よりもさらに第1の回転体の上流側に延びた形状を有し、その上流側に延びた先端部が第1の回転体表面から所定の間隙を隔てて配置された剥離シートを備えたことにより、本発明の第1の定着装置における同様、トナー像、用紙および第1の回転体に損傷を与えずに第1の回転体表面の未定着トナー像を安定して剥離することのできる剥離シートを備えた定着装置を実現することができる。

【図面の簡単な説明】

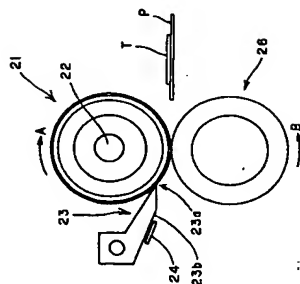
【図1】本発明の定着装置の第1の実施形態の概略構成図である。
【図2】第1の実施形態の定着装置に備えられた剥離シートの断面図である。
【図3】剥離力測定装置の概略構成図である。
【図4】本発明の第2の定着装置に用いられる剥離シートの断面図である。
【図5】図4に示す剥離シートの変形例を示す図である。
【図6】本発明の第3の実施形態に用いられる剥離シートの断面図である。



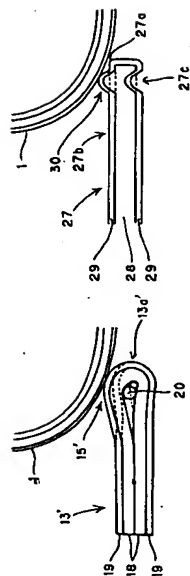
【図4】



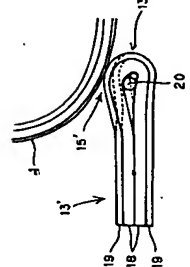
【図3】



【図6】



【図5】



【図9】

